



BASIC TRAINING

The PSM Basic Training platform was designed to provide the essential fundamental information on pumps, components, pump systems and other relevant topics. Watch webinars where HI subject matter experts present the fundamentals and read whitepapers to gain a more in-depth understanding.

PUMPS

i. Introduction to Positive Displacement Pumps.....	5
ii. Introduction to Rotodynamic Pumps.....	5
iii. Introduction to Rotodynamic Pump Selection.....	5
iv. Introduction to Selecting a Pump Test Acceptance Grade	5

SYSTEMS

i. Introduction to System Hydraulics.....	7
ii. Introduction to Flow Modeling	7
iii. Introduction to Pulsation Dampening.....	7
iv. Introduction to Water Hammer	8
v. Introduction to Pump System Curves	8
vi. Introduction to Vibration in Rotodynamic Pumps	8
vii. Introduction to Liquid Pumping Pressure and Drives	9

COMPONENTS

I. Introduction to Bearing Isolators.....	11
ii. Introduction to Eddy Current Drives	11
iii. Introduction to Expansion Joints.....	11
iv. Introduction to Mechanical Seals.....	12
v. Introduction to Bearing Lubrication.....	12
vi. Introduction to Induction Motors	12
vii. Introduction to Variable Frequency Drives	12
viii. Introduction to Rolling Element Bearings	13
ix. Introduction to Couplings in Pumping Applications.....	13

GENERAL

i. Introduction to HI Standards.....	15
ii. Introduction to PSAP Certification	15
iii. Introduction to the HI Energy Rating Program	15

iv. Introduction to the U.S. DOE Energy Conservation Standard 15
v. Introduction to Additive Manufacturing Printing and Casting 15

WHITE PAPER

i. Proper Lubrication Methods for Bearings..... 17
ii. Understanding the Effects of Selecting a Pump Performance Test Acceptance Grade..... 17
iii. New Combined Rotodynamic Pump Single Series Standards 17
iv. Vibration Characteristics of Stationary Engine Driven Rotodynamic Pump Systems 17

PUMPS

i. Introduction to Positive Displacement Pumps

Mark Johnson, Business Development Manager, Iwaki Air-Operated Double Diaphragm Pumps

- What a positive displacement pump is and what types of pumps are included in this classification
- The differences in various pump designs
- The markets where positive displacement pumps are commonly used
- Application considerations when using positive displacement pumps

ii. Introduction to Rotodynamic Pumps

Peter Gaydon, Director of Technical Affairs, Hydraulic Institute

- What a rotodynamic pump is, and the classifications of rotodynamic pumps
- Introduction to rotodynamic pump markets
- Overview of rotodynamic pump types and nomenclature
- Review of updated nomenclature from ANSI/HI 14.1-14.2-2019 Rotodynamic Pumps for Nomenclature and Definitions

iii. Introduction to Rotodynamic Pump Selection

Peter Gaydon, Director of Technical Affairs, Hydraulic Institute

- To identify issues and considerations when selecting a pump for a pump system
- Identify important system design criteria, NPSHA, system head, etc.
- Understand the pump and system curve, and the system operating point
- Understand important industry standards that support system design and pump selection/specification
- Learn how the HI Energy Rating label help when comparing properly selected pumps

iv. Introduction to Selecting a Pump Test Acceptance Grade

Peter Gaydon, Director of Technical Affairs, Hydraulic Institute

- Understanding of hydraulic acceptance test grades for rotodynamic pumps and their effect on the equipment size, operation in the field, cost, and delivery
- The applicable hydraulic acceptance test standards
- The harmonized acceptance grades in each standard
- The grades of acceptance testing for rotodynamic pumps
- The different unilateral and bilateral tolerances that may be applied to the guaranteed point
- The impact on cost, delivery, and power consumption due to the hydraulic acceptance graded specified
- The impact on motor sizing that unilateral and bilateral acceptance grades can have
- How submittal curves may reflect the acceptance grade

SYSTEMS

i. Introduction to System Hydraulics

Bob Hawboldt, Senior Specialist, Associated Engineering

- Developing the system curve
- Understanding the pump curve
- Pump/system interaction and the operating point
- Varying the operating point
- Introduction to Parallel and Series pumping

ii. Introduction to Flow Modeling

Dominik Fry, Product Manager, PIPE-FLO* Professional

Ben Kaiser, Technical Sales Consultant, Applied Flow Technology

- The benefits of using hydraulic modeling software
 - Basic inputs required/conditions
- What hydraulic modeling can and can't tell you
- What are models solving? How does that relate to the software as a tool?
- What is analysis software and why use it? What are you solving?
- What kinds of things can you do with flow analysis, what can it help

iii. Introduction to Pulsation Dampening

Greg Duncan, Vice-President of Innovation & Engineering, Blacoh

Trey Walters, President, Applied Flow Technology

- Pumps and Pulsation
- Which types of pumps create pressure/flow pulsation and why
- Issues/problems created by pulsation
- Explanation of magnitude and frequency of pulsation for various pump types
- Pulsation Dampeners
- General principal of operation of a pulsation dampener
- Types of Dampeners and their Pros/Cons
- Configurations and their Pros/Cons
- Charge valve options
- Primary and secondary criteria for Dampener Specification
- Effect of Pulsation and Vibration on Piping Systems
- How analysis is accomplished
- Typical solutions for vibration problems

iv. Introduction to Water Hammer

Frank Smith, Executive Vice-President, Blacoh

Trey Walters, President, Applied Flow Technology

- Water Hammer Overview
 - Accidents
 - Physics - Four Stages of Water Hammer
 - Joukowsky Equation
 - Communication Time
 - Different Types of Waterhammer
 - Brief Discussion of Fundamental Equations
- Pulsation Dampeners
 - General principal of operation of a pulsation dampener
 - Types of Dampeners and their Pros/Cons
 - Configurations and their Pros/Cons
- Types of Piping and Wave Speed
- Changing Component Behavior
- Surge Relief Valves
- Vacuum Breaker Valves
- Surge Vessels

v. Introduction to Pump System Curves

Peter Gaydon, Director of Technical Affairs, Hydraulic Institute

- Calculate pump system power and energy consumption
- Describe typical pumping systems
- Explain pump and systems curves
- Explain how impeller diameter and speed or rotation impact pump performance
- Identify the pump operating point in a system and basic control
- Discuss options for pump system optimization

vi. Introduction to Vibration in Rotodynamic Pumps

Maki M. Onari, President, Mechanical Solutions

Paul A. Boyadjis, Director of Structural Engineering, Mechanical Solutions

Robert Sayer, President, The Vibration Institute

- The benefits of using hydraulic modeling software
- Basic inputs required
- Conditions
- Fundamentals of vibration theory
- Types of vibration
- Vibration data management, display/plots (FFT – amplitude vs. frequency)
- Vibration measurement, instrumentation
- Most common vibration issues: imbalance & misalignment

vii. Introduction to Liquid Pumping Pressure and Drives

Ujwal Sareen, Business Development Manager – Pump & Compression OEM's, Schneider Electric

Allan Hottovy, Sales Training Development Manager, Schneider Electric

Richard Jennens, Product Manager for Variable Frequency Drives and Softstarters, Schneider Electric

- Pressure Sensors & Drives Operational Basics for moving fluids & generating Power
- The Control Theory of Moving liquid versus Generating Power
- Pressure Sensors Form, Fit & Functional basics
- The questions to ask before designing your pump system
- Pump Drive theory and when you should use a Hard Start (On/OFF) pump control versus a Soft Starts or VFD drive system to control your pumps
- What Basic Control components are required to build a pumping solution
- Energy and Cost savings that can be realized using VFD pump controls
- New Smart VFD's role in modern pumping solutions

COMPONENTS

I. Introduction to Bearing Isolators

Matt Dawson, Design Engineer, Isomag Corporation

Megan Heer, Key Account Manager, Inpro/Seal

- Types of bearing protection devices
- Purpose of Bearing Isolators
- Types of Bearing Isolators
- Labyrinth Isolators
- Magnetic Isolators
- Certifications and Standards
- Required information to specify Bearing Isolators

ii. Introduction to Eddy Current Drives

Gary Patterson, Municipal Market Manager, DSI/Dynamic

Patrick Hogg, Application Engineering Manager for General Industry & Pumping, Nidec Corporation

- Learn the history of the technology
- Theory of operation
- Basic application considerations

Also included will be motor application recommendations for use with eddy current drives. The webinar will touch upon advantages offered by eddy current technology as well as some limitations or cautions.

iii. Introduction to Expansion Joints

Lloyd Aanonsen, President, General Rubber Corporation

John Merrill, Principal Engineer, EagleBurgmann

- Understand the features and benefits of performance metal and rubber expansion joint design
- Apply both restrained and unrestrained expansion joint arrangements effectively
- Identify the sources of damaging pipe stresses/nozzle loads and the consequences of neglecting them
- Recognize system optimization with reductions in footprint and energy consumption
- Learn how to minimize loads on piping, equipment and support structure
- Understand how to reduce material and construction costs
- Understand key elements of piping codes (ex. ASME B31.1, B31.3) and standards (ex. ANSI/HI 9.6.2, 9.6.6) for seamless integration
- Identify a plant reliability and efficiency program that includes: a condition-based preventive maintenance program, an improved assessment of failure modes, and conducting plant surveys with traditional and advanced inspection methods

iv. Introduction to Mechanical Seals

Henri Azibert, Camtrack, LLC

The basic principles of mechanical seals, design variations, and limits is a tool that allows users to ascertain if they can achieve the Mean Time Between Repairs desired

- Proper seal selection
- Gain a better understanding of how seal life is affected by proper equipment operation, equipment condition, and correct seal and material selection
- How to specify, select, and operate ancillary equipment used to control the seal's operating environment
- Which seal plan will produce the results required by the owner

v. Introduction to Bearing Lubrication

Nadeem Bhatti, Application Engineer, NSK Corporation

Matt Dawson, Design Engineer, Isomag Corporation

Megan Heer, Key Account Manager, Inpro/Seal

- What are the functions of a lubricating system
- Lubrication fundamentals for rolling element bearings
- Methods of rolling element bearing lubrication
- Review of the critical role quality and quantity of lubrication play in bearing function and life cycle
- Learn best practices for improving quantity and quality of lubrication
- Understanding of IP Codes (Ingress Protection)
- Overview of bearing isolator selection considerations

vi. Introduction to Induction Motors

Patrick Hogg, Application Engineering Manager for General Industry & Pumping, Nidec Corporation

- Basic knowledge on how AC Electric motors work
- Core principles and concepts relating to induction motors
- How to select and size the right motor for any pumping application
- Guidance on the electrical requirements and general functions of electric motors

vii. Introduction to Variable Frequency Drives

Nicole George, Product Manager, Eaton

Charles Tahara, Global Product Line Manager, Eaton

- Understand the benefits of variable frequency drives and the types of pumping applications that are most suitable for their use
- Be familiar with the basic architecture of VFD systems, including AC induction motor
- Understand the basic considerations that apply to selecting and applying a VFD in a pumping system
- Understand how the environment (temperature, altitude, cooling, etc.) affects the selection and operation of a VFD
- Understand how the electrical system (grounding, power quality, input/output cables, etc.) affects the selection and operation of the VFD

- Be able to troubleshoot the drive and electrical components and understand the likely causes of performance issues
- Be able to troubleshoot the motor and mechanical components and understand the likely causes of performance issues

viii. Introduction to Rolling Element Bearings

Nadeem Bhatti, Application Engineer, NSK Corporation

- The different types of rolling element bearings
- How rolling element bearings carry load
- Load and speed characteristics by type
- Bearings general features and applications
- General lubrication requirements
- Bearing fits and mounting considerations

ix. Introduction to Couplings in Pumping Applications

Patrick Standley, Business Development Manager, ABB OEM

Stefanie Casimir, Coupling Product Manager, ABB

- Primary functions of the coupling
- Types of pump couplings and their application considerations
- Pump coupling selection considerations
- Considerations to extend coupling life

GENERAL.

i. Introduction to HI Standards

Peter Gaydon, Director of Technical Affairs, Hydraulic Institute

Peter Gaydon, Hydraulic Institute's Technical Director, provides an overview of HI's Standards and Guidebook portfolio. An introduction into how HI creates standards and guidelines, an overview of the numbering scheme used, and an introduction into the numerous standards and guidelines that are published by HI.

ii. Introduction to PSAP Certification

Edgar Suarez, Manager of Technical Programs, Hydraulic Institute

- The importance of pump system assessments
- Eligibility requirements for the PSAP certification
- The application process
- How the certification exam was created
- How to schedule a certification exam
- Resources to help you study for the certification exam

iii. Introduction to the HI Energy Rating Program

Edgar Suarez, Manager of Technical Programs, Hydraulic Institute

An overview of the HI Energy Rating Program and how pump manufacturers and utilities can participate to provide incentive programs to end-users. Attendees will learn about the collaborative work between the DOE, HI, and other industry stakeholders to promote energy efficient pumps and how the HI Energy Rating is currently being utilized for energy efficient incentive programs.

iv. Introduction to the U.S. DOE Energy Conservation Standard

Peter Gaydon, Director of Technical Affairs, Hydraulic Institute

- The five options to calculate the performance metrics outlined in the DOE Energy Conservation Standard and Test Procedure for C&I Clean Water Pumps
- How to calculate constant load or variable load Pump Energy Index (PEI), for various clean water pump configurations

v. Introduction to Additive Manufacturing Printing and Casting

Raymond W. Monroe, Executive Vice President, Steel Foundry Society of America (SFSA)

Provides a basic framework to extract value from the design freedom created in Additive Manufacturing (AM) of metal parts and how casting technology both mirrors and utilizes AM. It introduces the history and the use of AM in casting and identifies the similarities and differences between casting and printed metal parts. It gives a description of AM printing metal parts, then the pros and cons of printing and casting parts.

WHITE PAPER

i. Proper Lubrication Methods for Bearings

This white paper is a guideline for the design and application of bearing housing systems for horizontal process pumps.

ii. Understanding the Effects of Selecting a Pump Performance Test Acceptance Grade

This paper highlights the importance of selecting the appropriate acceptance grade for pump performance testing to satisfy the needs of its intended service.

iii. New Combined Rotodynamic Pump Single Series Standards

HI completed a multi-year effort to combine the "1-series" standards covering centrifugal pumps and the "2-series" standards covering vertical pumps into a new, single "14 series" standard. This new American National (ANSI) Standard covers both pump types in a single standard series for rotodynamic pumps spanning:

- Nomenclature and Definitions ANSI/HI 14.1-14.2
- Design and Application ANSI/HI 14.3
- Performance Acceptance Tests ANSI/HI 14.6

iv. Vibration Characteristics of Stationary Engine Driven Rotodynamic Pump Systems

The purpose of this paper is to describe stationary engine vibration characteristics.